I. AMENDMENTS TO THE CLAIMS:

The following listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1-32. (Cancelled)

33. (New) A nuclear magnetic resonance method, the method comprising:
providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;
creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations;
allowing said quasi equilibrium nuclear spin ensemble state to remain for a time of equal to or substantially greater than $3T_1$, where T_1 is the spin lattice relaxation time;
breaking at least one symmetry operation of said Hamiltonian;
applying a sequence of magnetic fields to generate a nuclear magnetic resonance signal from said sample; and
detecting said nuclear magnetic resonance signal.

34. (New) A method according to claim 33, wherein said quasi equilibrium nuclear spin ensemble state created is a singlet state population.

35. (New) A method according to claim 33, wherein said quasi equilibrium nuclear spin ensemble state created is a not a singlet state population.

36. (New) A method according to claim 33, wherein providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations comprises reducing the magnetic field to a value where a symmetry operation is imposed on the Hamiltonian.

37 (New) A method according to claim 33, wherein providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations comprises applying a radiofrequency pulse sequence to eliminate chemical shift differences.

38. (New) A method according to claim 33, wherein providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations comprises subjecting the sample to a chemical reaction configured to switch the molecules of the sample between different conformational or configurational states.

39. (New) A method according to claim 38, wherein said chemical reaction is a photoisomerization reaction.

40. (New) A method according to claim 39, wherein said photoisomerization reaction is configured to switch a molecule from a mixed cis-trans form to a pure cis form or trans form.

41. (New) A method according to claim 33, wherein creating said quasi equilibrium nuclear spin ensemble state comprises subjecting the sample to radiofrequency pulses of a magnetic field in a high magnetic field environment.

42. (New) A method according to claim 33, wherein creating said quasi equilibrium nuclear spin ensemble state comprises reacting an unsaturated symmetric molecule with parahydrogen.

43. (New) A method according to claim 33, wherein creating said quasi equilibrium nuclear spin ensemble state comprises reacting an unsaturated non-symmetric molecule with parahydrogen and providing the product of the reaction in a low magnetic field.

44. (New) A method according to claim 33, wherein said sample with said quasi equilibrium nuclear spin ensemble state flows through an apparatus or a body.

45. (New) A method according to claim 33, wherein said sample with said quasi equilibrium nuclear spin ensemble state is reacted with a second sample.

46. (New) A method according to claim 33, wherein said sample with said quasi equilibrium nuclear spin ensemble state is purified.

47. (New) A method according to claim 33, wherein said sample with said quasi equilibrium nuclear spin ensemble state is placed in contact with a second sample.

48. (New) A method according to claim 33, breaking said symmetry comprises transporting said sample into a high magnetic field.

49. (New) A method according to claim 33, wherein breaking said symmetry comprises reacting said sample with a further chemical.

50. (New) A method according to claim 33, wherein breaking said symmetry comprises subjecting said sample to a photochemical reaction.

51. (New) A method according to claim 33, wherein breaking said symmetry comprises terminating an application of a pulse sequence designed to suppress chemical shift differences

52. (New) A method according to claim 33, wherein electromagnetic induction is used to detect said nuclear magnetic resonance signal.

53. (New) A method according to claim 33, wherein the B field from the magnetic nuclei is directly detected.

54. (New) A nuclear magnetic resonance method, the method comprising:

providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations, said quasi equilibrium nuclear spin ensemble state not having a singlet state population;

breaking the symmetry operation of said Hamiltonian;

applying a sequence of magnetic fields to generate a nuclear magnetic resonance signal from said sample; and

detecting said nuclear magnetic resonance signal.

55. (New) A method according to claim 54, further comprising allowing said quasi equilibrium nuclear spin ensemble state to remain for a time of equal to or substantially greater than $3T_1$, where T_1 is the spin lattice relaxation time before breaking at least one symmetry operation of said Hamiltonian.

56. (New) A nuclear magnetic resonance apparatus, the apparatus comprising:

means for providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

means for creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations, said quasi equilibrium nuclear spin ensemble state not having a singlet state population;

means for breaking the symmetry operation of said Hamiltonian;

means for applying a sequence of magnetic fields to generate a nuclear magnetic resonance signal from said sample; and

means for detecting said nuclear magnetic resonance signal.

57. (New) A method of storing information, said method comprising:

providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations; and

assigning a bit value to at least one spin state of said quasi equilibrium nuclear spin ensemble state and storing said spin state for a time equal to or substantially greater than $3T_1$, where T_1 is the spin lattice relaxation time.

58. (New) A method of storing information, said method comprising:

providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations, said quasi equilibrium nuclear spin ensemble state not having a singlet state population; and

assigning a bit value to at least one spin state of said quasi equilibrium nuclear spin ensemble state and storing said spin state for a time equal to or substantially greater than $3T_1$, where T_1 is the spin lattice relaxation time.

59. (New) An apparatus for storing information, said apparatus comprising:

means for providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

means for creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations; and

means for assigning a bit value to at least one spin state of said quasi equilibrium nuclear spin ensemble state and storing said spin state for a time equal to or substantially greater than $3T_1$, where T_1 is the spin lattice relaxation time.

60. (New) An apparatus for storing information, said apparatus comprising:

means for providing a sample where the nuclear spin Hamiltonian operator of the component molecules of the sample possess one or more symmetry operations;

means for creating a quasi equilibrium nuclear spin ensemble state in a sample, said quasi equilibrium nuclear spin ensemble state comprising at least two manifolds of spin states which transform differently under said symmetry operations of said Hamiltonian and said manifolds having different mean nuclear spin populations, said quasi equilibrium nuclear spin ensemble state not having a singlet state population; and

means for assigning a bit value to at least one spin state of said quasi equilibrium nuclear spin ensemble state.